Hither & Thither

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Risk Management at a Glance

By Gary W. Helmer

Managing risk is essential to every operation and activity we participate in or supervise. Risk management is the formal, five-step process that begins in the planning stage of the mission and continues throughout mission execution. The method is administered through the development and application of risk management procedures down to the lowest levels of leadership and ends with the after action review process.

Commanders have inherent responsibilities in conducting risk management training for all assigned and attached personnel. Commanders must ensure that operating systems function to standard in order to prevent human error, material failures, and reduce environmental effects. They must also establish risk management policies with realistic objectives and priorities. Commanders ensure integration of risk management into plans and execution of all operations. Making decisions at the appropriate levels is a critical command function. By selecting and enforcing control measures for the most severe and probable hazards the commander implements a key element of the process. Following implementation, the commander must evaluate the effects of control measures in reducing risks. He or she can do this by determining the effectiveness of control measures and make necessary changes to guidance and control. Finally, the commander must ensure that the changes are fed back to subordinates as guidance for future missions and standing operating procedures (SOP).

Safety personnel must assist unit personnel in the conduct of risk management. Conducting training in the practice of risk management and reviewing risk management applications for lessons learned and improvements are essential duties of safety officers.

Each individual must understand and implement the risk management control measures as directed and report the effectiveness of these control measures during after action reviews.

Some Definitions

Hazard. Any actual or potential condition that can cause injury, illness, or death of personnel, damage to or loss equipment, property or mission degradation.

or

Any real or potential condition that can cause injury, illness, or death to personnel or damage to or loss or equipment or property, mission degradation, or damage to the environment.

or

A condition or activity with potential to cause damage, loss or mission degradation.

Risk. Chance of a hazard or bad consequences; the probability of exposure to chance of injury or loss from a hazard; risk level is expressed in terms of hazard probability and severity.

Chance of adverse outcome or bad consequence; such as injury, illness, or loss. Risk level is expressed in terms of hazard probability and severity.

Tactical Risk. Risk concerned with a hazard that exists because of the presence of either the enemy or adversary. It applies to all levels of war and across the spectrum of operations.

Accident Risk. All operational risks other than tactical risk including:

- Risks to the friendly forces.
- Risks posed to civilians by an operation.
- Risks to the environment.
- Risks to equipment readiness.

Residual Risk. The level of risk remaining after controls have been identified and selected for hazards that may result in loss of combat power.

or

Risk remaining after controls have been identified and selected.

Probability. The likelihood that an event will occur.

- Frequent – Occurs often, continuously experienced.
- Likely – Occurs several times.
- Occasional – Occurs sporadically.
- Seldom – Unlikely, but could occur at some time.
- Unlikely – Can assume that it will not occur.

or

An assessment of the likelihood that, given exposure to a hazard, an accident will result.

Severity. The expected consequence of an event in terms of degree of injury, property damage, or other mission-impairing factors that could occur.

or

An assessment of the expected consequence, defined by degree of injury or occupational illness that

could occur from exposure to the hazard.

or

The expected consequence of an event in terms of degree of injury, property damage, or other mission-impairing factors.

- Catastrophic – Death or permanent total disability, system loss, major property damage, not able to accomplish mission.
- Critical – Permanent partial disability, temporary total disability in excess of 3 months, major system damage, significant property damage, significantly degrades mission capability.
- Marginal – Minor injury, lost workday accident, minor system damage, minor property damage, some degradation of mission capability.
- Negligible – First aid or minor medical treatment, minor system impairment, little/no impact on accomplishment of mission.

Estimating. Follows from examining both probability and severity of hazardous incidents.

Exposure. The frequency and length of time personnel and equipment are subjected to a hazard.

or

An expression of personnel exposure that considers the number of persons exposed and the frequency duration of the exposure.

Risk Assessment. Identification and assessment of hazards; an identified hazard is assessed to determine the risk of a hazardous incident due to the presence of the hazard.

or

A structured process to identify and assess hazards. An expression of potential harm, described in terms of hazard severity, accident probability, and exposure to hazard.

Risk Decision. The decision to accept or not accept the risk(s) associated with an action. Made by the commander, supervisor, or individual performing the action within the constraints of the law.

Risk Management. The process of identifying, assessing, and controlling risks arising from operational factors and making decisions that balance risk cost with mission benefits.

or

The Department of Defense's principal structured risk reduction process to assist leaders in identifying and controlling safety and health hazards and making informed decisions.

Risk Management Assists the commander or leader in:

- Conserving lives and resources and avoiding unnecessary risk.
- Making an informed decision to implement a course of action.
- Identifying feasible and effective control measures where specific standards do not exist.
- Providing reasonable alternatives for mission accomplishment.

Risk Management Does Not -

- Inhibit the commander's and leader's flexibility and initiative.
- Remove risk altogether, or support a zero defects mindset.
- Require a GO/NO-GO decision.
- Sanction or justify violating the law.
- Remove the necessity for standard drills, tactics, techniques, and procedures.

Risk Management Integration. The embedding of risk management principles and practices into Army operations, culture, organizations, systems, and individual behavior.

Gambling. Making risk decisions without reasonable or prudent assessment or management of the risks involved.

Base Operations. Concerns include prioritizing the execution of base operations functions to get the most benefit from available resources. Examples include:

- Allocating resources for pollution prevention
- Correcting safety and health hazards
- Correcting violations of environmental protection regulations

The Five-Step Process

Step 1
Identify Hazards

Hazards lead to risk, so the first step is to identify relevant hazards. Consider all aspects of current and future situations, environment, and known historical problems.

In identifying hazards, experience and training cannot be overemphasized; it is the most effective tool available. Those who have experience must use it, if an organization is to effectively use the RM process. Still, everyone is responsible for, and should be involved in finding potential hazards and informing their supervisor.

Visualization is an effective method to identify hazards. Picture the planned operation, think of what could go wrong—ask yourself what

if? This can be done by an individual or a group, and can also use quality techniques such as brainstorming, "five whys", mental imaging, affinity diagrams, or cause-effect diagrams. The bottom line is: Honestly assess the planned procedure—Think of what could go wrong, no matter how unlikely.

Recognize Hazards: The Activity Hazard Analysis and Job Hazard Analysis (JHA) are both excellent tools to help identify risk as you think through a course of action to be examined. This is accomplished by reviewing current and planned operations describing the task. The supervisor defines what is required to accomplish the tasks and the conditions under which these tasks are to be conducted.

Construct a list or chart depicting the major steps in the job process, normally in time sequence. Break the operation down into 'bite size' chunks.

Some tools that will help perform mission/task analysis are:

- Activity Hazard Analysis
- Job Hazard Analysis
- Flow Diagram
- Multilinear Event Sequence (MES)
- Sequentially Timed Event Plot (STEP)

List Hazards: Hazards, and factors that could generate hazards, are identified based on the deficiency to be corrected and the definition of the task and system requirements. The identification phase produces a listing of hazards or adverse conditions and the accidents which could result. Examples of inherent hazards in any one of the elements include fire, explosion, collision with objects, or electrocution. The analysis must also search for factors that can lead to hazards such as alertness, ambiguity, or escape route. In addition to a hazard list for the elements above, interfaces between or among these elements should be investigated for hazards. An individual required to make critical and delicate adjustment to equipment on a cold, dark night may be at risk to a frost-bite injury, maybe an example of the "interface hazards." Make a list of the hazards associated with each step in the task process. Stay focused on the specific steps in the task being analyzed. Try to limit your list to "big picture" hazards (the final link in the chain of events leading to task degradation, personnel injury, death, or property damage). Hazards should be tracked on paper or in a computer spreadsheet or database system to organize ideas and serve as a record of the analysis for future use. Tools that help list hazards are:

- Preliminary Hazard Analysis
- Change Analysis
- Brainstorming
- "What if" Analysis
- Identify hazards associated with these three categories:
- Task Degradation
- Personal Injury or Death
- Property Damage

List Causes: Make a list of the causes associated with each hazard identified in the hazard list. A hazard may have multiple causes related to man, machine and environments. In each case, try to identify the root cause (the first link in the chain of events leading to mission degradation, personnel injury, death, or property damage). Risk controls can be effectively applied to root causes. Causes should be annotated with the associated hazards in the same paper or computer record mentioned in the previous action. Suggested tools are:

- Change Analysis
- Brainstorming
- "What if" Analysis
- Job Hazard Analysis

Refine Hazard Lists: If time and resources permit, and additional hazard information is required, use strategic hazard analysis techniques. These are normally used for medium and long term planning, complex tasks, or operations in which the hazards are not well understood. The first step of in-depth analysis should be to examine existing databases or available historical and hazard information regarding the operation. Suggested tools are:

- Database Analysis
- Accident History
- Cause and Effect Diagrams
- Tree Diagrams

The following tools are particularly useful for complex, coordinated operations in which multiple units, participants, and system components and simultaneous events are involved: Complex operations risk management tools are:

- Sequentially Timed Event Plot
- Multilinear Event Sequence
- Interface Analysis
- Failure Mode and Effect Analysis (FMEA)

There are many additional tools that can help identify hazards. One of the best is through a group process involving representatives directly from the workplace. A simple brainstorming process with a trained facilitator is very productive. The following is a partial list of sources of hazard identification:

Accident Reports: These can come from within the organization, from tenants, within the chain of command, MACOM, Safety Center, etc. Other sources might be medical reports, maintenance records, and fire and police reports.

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Inspector General (IG) reports: IG visits provide important feedback and written documentation on local process management.

Surveys: These can be unit generated. Target an audience and ask some very simple questions related to such topics as: What will your next accident be? Who will have it? What task will cause it? When will it happen? The survey can be a powerful tool because it pinpoints people in the workplace with first hand knowledge of the job. Often, first line supervisors in the same workplace won't have as good an understanding of risk as those who confront it every day.

Inspections: Safety inspections can consist of spot checks, walk-throughs, checklist inspections, site surveys, and mandatory inspections. Use onsite workers to provide input beyond the standard third-party inspection.

Step 2
Assess Hazards

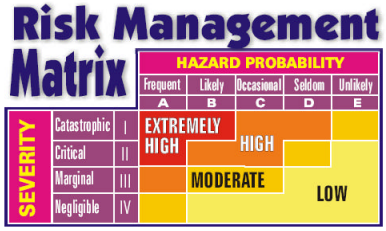
Once hazards are found, the next step is to analyze the associated risk how likely and how big a loss is possible? Recognition and assessment is the core of the Risk Management process. Risk Management process depends on doing good analyses at each step in the process.

Assess Hazard Exposure: Probability is affected by exposure. Repeated exposure to a hazard greatly increases the total likelihood of an accident. This can be expressed in terms of time, proximity, volume, or repetition. Does it happen often, or near personnel or equipment? Does the event happen to a lot of people or equipment? This level can aid in determining the severity or the probability of the event. Additionally, it may serve as a guide for devising control measures to limit exposure.

Another important concept is interaction. Interaction occurs when two (or more) hazards are present and their total risk is much greater than simply adding their separate risks. It's more like multiplying than adding. Often it is the combination of several factors that make a situation hazardous, rather than any single factor. Experience and clear thinking are the best ways to consistently assess interaction.

Assess Hazard Severity: Determine the severity of the hazard in terms of its potential impact on the people, equipment, or mission. Cause and effect diagrams, scenarios and "What-If" analysis are some of the best tools for assessing the hazard severity. Severity assessment should be based upon the worst possible outcome that can reasonably be expected. Severity categories are defined to provide a qualitative measure of the worst credible accident resulting from personnel error, environmental conditions; design inadequacies; procedural deficiencies; or system, subsystem, or component failure or malfunction. Using severity categories provide guidance to a wide variety of missions and systems.

Assess Accident Probability: Determine the probability that the hazard will cause an accident or loss of the severity assessed above. Accident probability is proportional to the cumulative probability of the identified causes for the hazard. Probability may be determined through estimates or actual numbers, if they are available. Assigning a quantitative accident probability to a new mission or system may not be possible early in the planning process. A qualitative accident probability may be derived from research, analysis, and evaluation of historical safety data from similar missions and systems. The typical accident sequence is much more complicated than a single line of erect dominos where tipping the first domino (hazard) triggers a clearly predictable reaction. Supporting rationale for assigning a accident probability should be documented for future reference.



Complete Risk Assessment: Combine severity and probability estimates to form a risk assessment for each hazard. By combining the probability of occurrence with severity, a matrix is created where intersecting rows and columns define a Risk Assessment Index (RAI), table 3-3, AR 385-10. The Risk Assessment Index forms the basis for judging both the acceptability of a risk and the management level at which the decision of acceptance will be made. The index may also be used to prioritize resources to resolve risks due to hazards or to standardize hazard notification or response actions. Severity, probability, and risk assessment should be recorded to serve as a record of the analysis for future use. Existing databases, Risk Assessment Index matrix, or a panel of personnel experienced with the mission and hazards can be used to help complete the risk assessment.

The following are some analytical pitfalls that should be avoided in the assessment:

- Over optimism: "It can't happen to us. We're already doing it."

This pitfall results from not being totally honest and not looking for root causes of risk.

- Misrepresentation: Individual perspectives may distort data.
- Alarmist: "The sky's falling" approach, or "worst case" estimates are used.
- Indiscrimination: All data is given equal weight.
- Prejudice: Subjectivity and/or hidden agendas are used, rather than facts.
- Inaccuracy: Bad or misunderstood data nullifies accurate risk assessment.
- It is difficult to assign a numerical value to human behavior.
- Numbers may oversimplify real life situations.
- It may be difficult to get enough applicable data, which could force inaccurate estimates.
- Oftentimes simple numbers take the place of reasoned judgment.
- Risk can be unrealistically traded off against benefit by relying solely on numbers.
-

Step 3
Develop Controls and Make Risk Decisions

In this area, one must "develop control measures that eliminate the hazard or reduce its risk. As control measures are developed, risks are re-evaluated until all risks are reduced to a level where benefits outweigh potential cost."

Identify Control Options: The process of developing controls starts by taking the risk levels determined in Step 2, then identifying as many risk control options as possible for all hazards which exceed an acceptable level of risk. Refer to the list of possible causes from Step 1 for control ideas. Brainstorming, mission accident analysis and "What-If" analysis are excellent tools to identify control options. Risk control options include: avoidance, reduction, spreading and transference.

Avoiding risk altogether requires canceling or delaying the job, mission, or operation, but is an option that is rarely exercised due to mission importance. However, it may be possible to avoid specific risks: like wearing proper personal protective equipment can reduce risks in most job areas.

Risk can be reduced. The overall goal of risk management is to plan missions or design systems that do not contain uncontrolled hazards. A proven order of precedence for dealing with hazards and reducing the resulting risks is:

Plan or Design for Minimum Risk. From the first, plan the mission or design the system to eliminate hazards. Without a hazard there is no probability, severity or exposure. If an identified hazard cannot be eliminated, reduce the associated risk to an acceptable level.

Incorporate Safety Devices. If identified hazards cannot be eliminated or their associated risk adequately reduced by modifying the mission or system elements or their inputs, that risk should be reduced to an acceptable level through the use of safety design features or devices. Safety devices usually do not effect probability but reduce severity: an automobile seat belt doesn't prevent a collision but reduces the severity of injuries. Nomex gloves and steel toed boots won't prevent the hazardous event, or even change the probability of one occurring, but they prevent, or decrease the severity of, injury. Physical barriers fall into this category.

Provide Warning Devices. When mission planning, system design, and safety devices cannot effectively eliminate identified hazards or adequately reduce associated risk, devices should be used to detect the condition and warn personnel of the hazard. Warning signals and their application should be designed to minimize the probability of the incorrect personnel reaction to the signals and should be standardized. Flashing red lights or sirens are a common warning device that most people understand.

Develop Procedures and Training. Where it is impractical to eliminate hazards through design selection or adequately reduce the associated risk with safety and warning devices, procedures and training should be used. If the system is well designed and the mission well planned, the only remaining risk reduction strategies may be procedures and training. Emergency procedure training and disaster preparedness exercises improve human response to hazardous situations.

Risk is commonly spread out by either increasing the exposure distance or by lengthening the time between exposure events. Administratively controlling exposure events, substitution of less hazardous chemicals or reengineering an operation to reduce exposures to chemicals or toxic agents are examples.

Risk transference does not change probability or severity, however, possible losses or costs are shifted to another entity. An example is locating a remote sensing device in a high risk environment instead of risking personnel.

Common ways to control risks include:

- Protective equipment, clothing, or safety devices (PPE).

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- Highlight hazards for extra care and handling.
- Warnings (signs, color coding, audio/visual alarms).
- Repair hazards or build new facilities.
- Limit exposure consistent with mission needs.
- Train and educate.
- Incorporate firm, fail-safe go/no-go criteria.
- Select experienced or specialized personnel.
- Increase and /or select more highly qualified and experienced supervision.
- New policy formal/informal, written/unwritten.
- Develop new procedures.

Develop Control Options: Determine the controls for the risk associated with the hazard. A computer spread sheet or data form (Job Hazard Analysis) may be used to list control ideas and indicate control effects. The estimated value(s) for severity and/or probability after implementation of control measures and the change in overall risk assessed from the Risk Assessment Index should be recorded. Scenario building and next accident assessment provide the greatest ability to determine control effects.

Select Controls: For each hazard, select those risk controls that will reduce the risk to an acceptable level.. The decision maker selects the control options after being briefed on all the possible controls. The best controls will be consistent with mission objectives and optimum use of available resources (manpower, material, equipment, money, time. It is not an ad hoc decision, but rather a logical, sequenced part of the risk management process. Decisions are made with awareness of hazards and how important hazard control is to success or failure of the mission (cost versus benefit).

Step 4
Implement Controls

The decision maker must allocate resources to control risk. Control decisions must be made at the appropriate level. The standard for risk management is leadership at the appropriate level of authority making informed decisions control hazards or accept risks.

Safety advisors and consultants do not control the necessary resources to implement the control decisions. Appropriate levels of decisions making reflect the ability of the decision maker to resource the controls.

Resource Controls: For each identified hazard, resource controls that will reduce the risk to an acceptable level. The best controls will be consistent with mission objectives and optimum use of available resources (manpower, material, equipment, money, and time). Record implementation decisions for future reference. Should management determine that the controls require resources beyond their authority, they should elevate the risk decision to higher authority.

Order Controls: To be successful, command must support the control measures put in place. Then, explore appropriate ways to demonstrate command commitment. Provide the personnel and resources necessary to implement the control measures. Design in sustainability from the beginning. Deploy the control measure with a feedback mechanism that provides information on whether the control measure is achieving the intended purpose.

Step 5
Supervise and Evaluate

Supervise: Monitor the operation to ensure: The controls are effective and remain in place. Changes which require further risk management are identified.

Action is taken when necessary to correct ineffective risk controls and reinitiate the risk management steps in response to new hazards.

Anytime personnel, equipment or mission taskings change or new operations are anticipated in an environment not covered in the initial risk management analysis, the risks and control measures should be reevaluated. The goal of measurement is to answer the question of whether the control measure in fact controlled the associated hazard. The best tool for accomplishing this action of supervision is Change Analysis.

Evaluation: The process review must be systematic. After assets are expended to control risks, then a cost benefit analysis must be accomplished to see if risk and cost are in balance. Any changes in the system (the flow charts from the earlier steps provide convenient benchmarks to compare the present system to the original) are recognized and appropriate risk management controls are applied.

To accomplish an effective review:

- Identify whether the actual cost is in line with expectations.
- What effect the control measure has had on mission performance.
- Provide mission feedback system to ensure that the corrective or preventive action taken was effective and that any new hazards identified during the mission are analyzed and corrective action taken.

Audits: Measurements are necessary to ensure accurate evaluations of how effectively controls eliminated hazards or reduced risks. After action reports, surveys, and in progress reviews provide great starting places for measurements. To be meaningful, measurements must quantitatively or qualitatively identify reductions of risk, improvements in mission success, or enhancement of capabilities.

The Risk Management Evaluation Profile (OSHA's PEP) in appendix B, provides an audit process of a programs overall effectiveness. Benefits of conducting an audit include:

- Formally going through the internal audit process with managers and employees.
- Formally reviewing the elements of a safety and health program.
- Getting managers involved in the audit process.
- Making managers, supervisors, and employees aware of the scope and complexity of a formal safety and health program, and of their roles and responsibilities in the programs success.

After finishing your audit share the results with managers and legal personnel. However the process of doing an audit creates a paper trail of the programs weaknesses. The audit is a formal tool to uncover weak points in the management system that create unsafe work practices and unsafe conditions that can injure workers, diminish their health, interrupt production, or damage products and property.

Principles

- Integrate risk management into planning.
- Accept no unnecessary risks.
- Make risk decisions at the appropriate level.
- Accept risk only if benefits outweigh the cost.

Risk management provides a logical and systematic means of organizing information for rational decision-making, to identify and control risk. Risk management is a process that requires individuals, supervisors and leaders to support and implement the basic principles, along with the discipline to apply them on a continuing basis. Risk management offers individuals and organizations a powerful tool for eliminating accidents and increasing effectiveness. This process has the unique advantage of being accessible to and usable by everyone in every conceivable setting or scenario. It ensures that all Army personnel will have a voice in the critical decisions that determine success or failure in all our missions and activities, on- and off-duty. *gwh/02*

Risk Management Websites

United States Army Safety Center
http://safety.army.mil

Society for Risk Analysis
http://www.sra.org/

Society for Risk Analysis - Glossary
http://www.sra.org/glossary.htm

Risk Management Internet Services
http://www.rmis.com/

The Risk Management Association
http://www.rmahq.org/

Chemical Accident Prevention and Risk Management Programs - EPA
http://www.epa.gov/swercepp/acc-pre.html

National Risk Management Research Laboratory - EPA
http://www.epa.gov/ORD/NRMRL/

State Office of Risk Management – Texas
http://www.sorm.state.tx.us/

Institute for Crisis, Disaster, and Risk Management – George Washington University
http://www.seas.gwu.edu/~icdm/

Field Manual 100-14, Risk Management
http://www.adtdl.army.mil/cgi-bin/atdl.dll/fm/100-14/default.htm

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A Parting Thought

"Education is itself an education."

Thanks!